

Developing a Framework for Evaluating Proposals for Research in Wilderness: Science to Protect and Learn from Parks

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Abstract

In designated park wilderness, the requirements for scientific research often conflict with requirements designed to protect wilderness resources and values. Managers who wish to realize the benefits of scientific research must have a process by which to evaluate those benefits as well as their associated wilderness impacts. Glacier Bay National Park and Preserve, in collaboration with the Aldo Leopold Wilderness Research Institute and several non-NPS researchers, has drafted a decision process that balances potential impacts to wilderness with potential benefits to wilderness, the park, and science. The park works closely with researchers to minimize wilderness impacts to the greatest possible extent while maximizing potential benefits. This process is applied equally and consistently to all scientists (internal and external), is communicated clearly, and is a means to ensure that permitted research minimally impacts wilderness while providing information that ultimately protects it.

Introduction

Alaska hosts over three-fourths of the nation's designated wilderness, and Americans view their Alaska wilderness as quintessential and definitive—the wildest and least disturbed anywhere. Consequently, wilderness managers in Alaska believe they have a special responsibility to protect it. At the same time, in part because Alaska wilderness parklands comprise some of the continent's (and the world's) last remaining pristine ecosystems, they provide very highly valuable opportunities for scientific research. Park managers, agency policies, and law recognize that research is a valuable and legitimate use of wilderness, yet scientific activity sometimes involves access and methods that are inconsistent with the protection of wilderness resources and/or values. [Although not addressed in this paper, the authors also recognize that wilderness policy can sometimes negatively impact the ability to conduct meaningful scientific research.] This fundamental conflict of protecting wilderness resources from the negative impacts of scientific activity—while simultaneously encouraging research that may ultimately better protect those resources—means that managers must carefully consider whether to approve or deny studies that have the potential for impacts. The “best” scientific activity minimizes negative impacts to wilderness while maximizing scientific benefits; indeed, these benefits can ultimately help protect the very wilderness in which the research is conducted. In this way, wilderness and science are mutually beneficial in that each contributes positively to the other (Figure 1).

This paper summarizes a framework that begins to get at

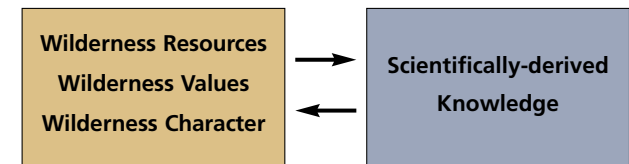


Figure 1. Scientific research and designated wilderness need not be fundamentally conflicting. Research often benefits greatly from the pristine natural conditions provided by wilderness, and this research can provide information that ultimately contributes to the understanding and protection of the wilderness.

the process of evaluating proposals for scientific research in wilderness in terms of net benefit or impact. The goal is for managers to use the framework as a tool that helps them to

- quickly recognize and welcome highly beneficial research;
- reject research activities that carry unacceptable negative impacts; and
- effectively mitigate the remaining “in between” proposals so that wilderness resources and values can be protected while the scientific benefits are optimized.

Focus on Impacts: Varying Approaches

Several wilderness managers have identified the potential for wilderness-research conflict and have proposed general methods for addressing it (*Six et al. 2000, Landres et al. 2003, Parsons 2004, Landres et al. in prep.*). Until recently there has been an agency bias toward focusing on negative impacts associated with scientific activity, at the

expense of explicitly valuing scientific benefits (more about this shortly). Most unit managers who have actually implemented a process to evaluate research proposals with wilderness protection in mind have adopted one of two approaches.

The first can be characterized as a numerical scoring approach, exemplified by that used at Yosemite National Park. Yosemite's Wilderness Research Impact Class Assessment (WRICA 2004), developed by Wilderness Specialist Mark Fincher, assigns points to different levels of impact. By way of a simple worksheet, various field elements (e.g., party size, collections, use of mechanized/motorized equipment or transport, installations) receive points proportional to their amount of impact. These scores are added together to yield a cumulative impact score for the project. Depending on the total number of points, a proposal falls into one of three categories. Class 1 projects involve simple observations made by small numbers of people, are covered by a programmatic Minimum Requirement Analysis (based on the Carhart MRDG described below), and are generally allowed to proceed as proposed. Class 2 projects have limited impact on wilderness resources and may involve some minor Wilderness Act 4(c) exceptions (e.g., use of a mechanized tool in designated wilderness, such as a cordless power drill) (Wilderness Act 1964) that require closer scrutiny by park management. Class 3 projects include at least one significant 4(c) Wilderness Act exception (e.g., motorized access) or otherwise pose significant risk to wilderness values. They require a separate Minimum

(Impact Category 1 Score) + (Impact Category 2 Score) + ... (Impact Category i Score)		
= Cumulative Impacts Score (CIS)		
CIS ≤ x		= Impact Class 1 (Low)
CIS > x and ≤ y		= Impact Class 2 (Moderate)
CIS > y		= Impact Class 3 (High)

Figure 2. The numerical scoring approach: representational algorithm of Yosemite National Park's Wilderness Research Impact Class Assessment (WRICA 2004); x and y thresholds are defined by the park.

Field Crew	Mechanized/Motorized Equipment	Magnitude of Effects
Very large group size (≥12)	2-cycle combustion engines (e.g., chainsaw)	Potential regional or greater effects (e.g., exotic species introduction)
Large group size (7-11)	4-cycle combustion engines (e.g., generator)	Potential effects extend over a broad area within/adjacent to park (e.g., stream manipulation, extensive aircraft use)
Small group size (2-6)	Solar, battery, wind, hydro-, and human-powered mechanical devices (e.g., battery-powered drill)	Potential effects confined to multiple small areas (e.g., several small sampling plots with excavations)
Single individual	No mechanized/motorized devices	Probable effects difficult to detect without prior knowledge (e.g., limited sampling of soil, seasonal plant growth, water)
No personnel onsite		No physical site impacts anticipated (e.g., photographic sampling, sound or climate monitoring)

Figure 3. The matrix approach: simplified schematic of Grand Canyon National Park's Wilderness Impact Matrix (Six et al. 2000). Note the heavy black "severity line". Impacts below the line are generally deemed acceptable, while those above the line indicate substantial issues that must be resolved. Not all impacts categories are shown.

Requirement Analysis, substantial mitigation, and explicit approval by the Park Superintendent. A very general algorithm appears in Figure 2.

The other alternative method utilizes a matrix approach. An excellent example is Grand Canyon National Park's Wilderness Impact Matrix developed by Bob Winfree and others (Six et al. 2000). As with the numerical scoring approach described above, the matrix technique first identifies the various impact types (mechanized/motorized equipment, magnitude of effects, etc.). These categories are the column headings in the two-dimensional matrix (Figure 3). Cells below the column headings represent (from top to bottom) decreasing degrees of impact magnitude. For example, cells in the "Frequency of Disturbance" column decrease in relative magnitude from (at the very top) continuous or near-continuous activity, to (at the bottom) no apparent impact. Thus the matrix becomes the evaluatory tool for the proposal, whereby one cell (degree of impact) for each column (type of impact) is circled. A key element of the grid is the "severity line" that is pre-defined for each impact category. This line is an important cue for evaluators; whenever a project element has the potential to

cause a magnitude of impact that is above the line, managers must take special note and strive to mitigate that impact to a lower level within the column, and without raising other impacts above the severity line if the project is to proceed (Figure 3).

In addition to an internal evaluation, many park units managing designated wilderness incorporate a formal "minimum requirement/minimum tool" process (see Yosemite's WRICA above). Typically, these are some form of the Minimum Requirements Decision Guide developed by the Arthur Carhart National Wilderness Training Center (MRDG 2005). This process first determines whether the proposed activity is indeed necessary. If so, the focus then shifts to determining, via development and consideration of alternatives, how the research objective can be accomplished with the least impact on wilderness.

Glacier Bay's Framework

Glacier Bay staff were favorably impressed by the "at-a-glance" nature of Grand Canyon's method, so we have tentatively adopted a modified version of their matrix approach for evaluating wilderness impacts. We believe

that matrices may be potentially more vulnerable to subjectivity (by nature less quantitative) than numerical scoring, but that this is counterbalanced by the advantages of flexibility and at-a-glance visual integration of the entire project. The matrix can be rapidly filled out by an evaluator, and it is visually intuitive in that one can quickly grasp what elements of a proposal have the greatest potential impacts. Glacier Bay’s version uses a different, somewhat more detailed list of impact categories (column headings), and a color scheme has been substituted for the Grand Canyon “severity line”. The Glacier Bay matrix shows minimally disruptive impacts as beige, those requiring increased scrutiny as blue, and those presenting serious wilderness conflicts requiring substantial mitigation and/or a special administrative waiver as gold (Figure 4).

What About Benefits?

Note that the above discussion has focused almost entirely on negative impacts to wilderness, although the process developed at the Grand Canyon also considered safety and potential impacts to the proposed project (e.g., cost of complying with permit stipulations) in the overall

matrix. Clearly, however, the results of scientific research can also *benefit* wilderness and science in general. It is important to recognize these benefits and to incorporate them into any evaluation of proposals. We believe the current bias toward valuing only impacts derives from agency focus on responsibility to protect wilderness. Policy and management directives of agencies and management units typically take the form of explicit regulation for resource protection but only implicit appreciation of the positive side of scientific research in wilderness.

The historic enabling Proclamation for Glacier Bay National Monument (now Park and Preserve) identifies resources and values central to why it was set aside for protection. These include several features (e.g., tidewater glaciers) and processes (e.g., ecological succession) that the public enjoys directly. It also—and unusually—explicitly identifies as positive values those same features and processes defined as opportunities for scientific research (Coolidge 1925). This mandate is reflected in the long and rich legacy of distinguished scientific inquiry that has been conducted in the park. Glacier Bay managers have always been sensitive to the potential positive values of scientific

research in the park, and we are presently developing a “benefits matrix” as a companion to the impacts matrix. Examples of benefits categories include potential for the research to preserve ecosystem integrity, detect change to avoid calamity, enhance visitor experience of wilderness character, and provide knowledge and understanding in general. This matrix remains to be refined and, finally, a strategy to weigh impacts and benefits must be developed.

Helpful Conceptual Tools

Several general concepts continue to inform completion of the full evaluatory framework:

- *Basic vs. Applied Research.* Basic research is curiosity-driven, is intended to illuminate basic characteristics or processes, and enhances knowledge in general. Applied research focuses on purposefully providing information to address certain issues; in our case, it seeks to directly answer important questions for wilderness/park management in a highly targeted way. Both are legitimate and valuable, but typically applied research that shows potential benefits to park resource management will be valued more highly against its associated impacts than other research where benefits would primarily accrue outside of the park.
- *Urgency and Importance.* Urgency implies time-sensitivity of obtaining the information deriving from the proposed research. If park management requires information quickly, or if science in general requires information quickly to address a problem bigger than the park, then this urgent research should accrue greater benefit. Similarly, if the research will provide information that will help address a particularly important resource concern having severe management implications if not reconciled, then that research will be viewed more favorably with regard to its potential impacts.
- *The Place Test and the Quality Test.* Research is sometimes highly wilderness-dependent (more commonly it is park-dependent), but not always. Assessing whether a proposed project must occur in park wilderness is an application of the Place Test. If the research objectives

Cumulative Days in Field	Means of Access	Installations
40 or more days	Helicopter, fixed-wing aircraft, ORV, snowmachine, airboat, hovercraft Motorized watercraft during closure period	Longevity = greater than 1 season; and/or Size = huge; Discernability = high; and/or Number = lots
8 to 40 days	Motorized watercraft during non-closure season	Longevity = 8 days up to full season; and/or Size = medium; Discernability = moderate; and/or Number = few to many
Up to 7 days	Human-powered (kayak, rowboat, walk, backpack, x-country ski, snowshoe, sled)	Longevity = up to 7 days; and/or Size = small; Discernability = low; and/or Number = 0 to 1
No field visit	N/A	N/A

Severe wilderness impact requiring substantial mitigation and/or administrative waiver. Substantial wilderness impact requiring careful scrutiny and mitigation; may require waiver. Minimal to no wilderness impact.

Figure 4. A portion of Glacier Bay National Park and Preserve’s impacts evaluation matrix (sampled from the full grid).

can be accomplished somewhere outside of designated wilderness, then the work probably should be conducted there. The Quality Test is an assessment of how likely the research, as proposed, will accomplish its stated objectives. This often occurs by way of peer review. Proposed projects scoring poorly on the Quality Test are less likely to produce benefits that mitigate their wilderness impacts.

- *It is the METHODS that create the impacts.* Most valuable research can be conducted in multiple ways. It is important to focus on the methods and tools (helicopters, field installations, ways of marking study plots or animals) rather than the scientific objectives. Methodological approaches can be modified, and the potential impacts of many legitimate research projects can and should be mitigated to allow them to proceed.
- *Cumulative Impacts.* The potential impacts of any single project must be considered within the larger context of all other project impacts occurring within the wilderness. Although the potential impacts associated with one project may not be deemed significant, when combined together with all other impacts associated with all other projects proposed for that wilderness, the cumulative impacts may be substantial indeed. Parks must always be alert to the potential for this “tyranny of small decisions”, while also recognizing that the cumulative impacts of many studies in a large area and over a long period of time can be minimized by careful design and implementation.
- *WHO evaluates?* Evaluation of proposed research projects is typically conducted by park staff. It is important to keep in mind that evaluations should be made from a breadth of perspectives ranging from the very objective scientific to more the value-laden wilderness philosophy/experiential. Both are legitimate and essential, and both must be possessed by the review team.
- *The Decision Matrix.* Ultimately, the critically central question remains: are the benefits worth the impacts? The conceptual benefits:impacts matrix assigns relative weights to potential benefits and associated impacts to

provide guidance for accepting or declining a research proposal (Figure 5). When benefits outweigh impacts, the proposed research is allowed; when the reverse is true, the research is denied or—more frequently—returned to the applicant so that they may modify it to increase its benefits and/or decrease its impacts.

Finally, and perhaps most importantly, it has been our experience that effective communication and negotiation are key. Mitigation to allow coexistence of wilderness quality and scientific activity is our goal (Figure 1). Glacier Bay park staff work closely with scientists to ensure they understand park wilderness values, the importance of minimizing wilderness impacts, optimizing scientific benefits, and how we evaluate proposals to balance them. A great deal of effort is invested in working with prospective researchers to negotiate and facilitate the proposal process. Our goal is to encourage as much high-quality, relevant science as possible while still protecting the park’s precious wilderness resources and values. This is the communication—the give-and-take—between park managers and scientists that leads to the granting of the research permit. Thus we maximize and support excellent research that ultimately contributes to the protection of park wilderness.

	No Benefits	Some Benefits	Lot of Benefits	Very Extensive Benefits
No Impacts	?	A	A	A
Some Impacts	D	?	A	A
Lots of Impacts	D	D	?	A
Very Severe Impacts	D	D	?	?

Figure 5. Decision matrix. “A” indicates acceptance of proposal, and “D” indicates denial. The borderline “?”s are those proposals where effective mitigation of impacts and optimization of benefits may still allow acceptance.

Acknowledgements

The ideas for this paper sprang from a workshop sponsored by Glacier Bay National Park and Preserve in October 2005. We thank the many resource and wilderness managers whose work has informed our perspective on this topic. This manuscript was significantly improved by suggestions from Robert Winfree and two anonymous reviewers.

References

- Coolidge, C., President of the United States. 1925.** Proclamation establishing Glacier Bay National Monument, Alaska.
- Landres, P., J. Alderson, and D.J. Parsons. In Preparation.** *Guidelines for evaluating proposals for scientific activities in wilderness.*
- Landres, P., J. Alderson, and D.J. Parsons. 2003.** *The challenge of doing science in wilderness: historical, legal, and policy context.* George Wright Forum 20(3):42-49.
- Minimum Requirements Decision Guide (MRDG). 2005.** Arthur Carhart National Wilderness Training Center. Missoula, Montana.
- Parsons, D.J. 2004.** *Science and the management of protected areas. In Managing mountain protected areas: challenges and responses for the 21st century, Proceedings of the Mountain Protected Areas Workshop,* edited by D. Harmon and G.L. Worboys. 5th World Parks Congress, Durban, South Africa. Pp. 36-40.
- Six, D.L., P. Alaback, R.A. Winfree, D. Snyder, and A. Hagele. 2000.** *Wilderness for science: pros and cons of using wilderness areas for biological research. In Wilderness science in a time of change conference, Missoula, Montana,* compiled by S.F. McCool, D.N. Cole, W.T. Borrie, and J. O’Loughlin. USDA Forest Service Proceedings RMRS-P-15-VOL-3. Pp. 271-275
- Wilderness Act of 1964.** U.S. Public Law 88-577, 78 Stat. 890.
- Wilderness Research Impact Class Assessment. 2004.** Yosemite National Park, California.